Language and its computations

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Generative grammars and neuronal networks

- 'Software' of language production and comprehension seems to be best specified by generative grammars

- Underlying 'hardware' is networks of neurons

- Connectionist and computationalist pictures need not be at odds with each other: they are different levels of abstraction

- Connectionism does not imply a *tabula rasa*. We can still have innate constraints (Universal Grammar)

- Faculty of Language: distinct module, or specialised program running on more generic cognitive architecture?

Neural networks as computational systems

- Neurons: switch-like, either ON (1) or OFF (0)
- Take a weighted sum of inputs and apply a threshold to it, to decide whether to fire or not
- Can thus encode more abstract logical operations
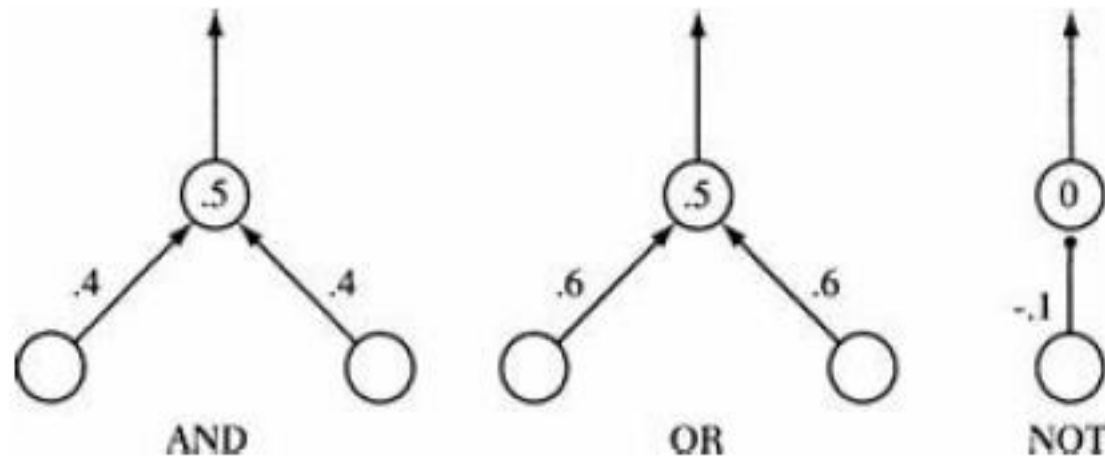
[Pinker 1997]

Cognition as pattern recognition

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[Matt Davis, MRC Cognition and Brain Sciences Unit, Cambridge]

[Pinker 1997]

- Robustness to noise and missing information; inference to fill in missing details
- Fits with computational neural network models; hard to explain with purely rule-based models
- Language acquisition: May not be rule-based

An example: Merge

- Key component of the Minimalist machinery

- High-level manipulation of syntactic structures, with recursion

- Can perhaps be embodied at a lower level by a kind of recursive neural network?

- May be differences, but suggests that symbolic computations of language can emerge from connectionist architectures
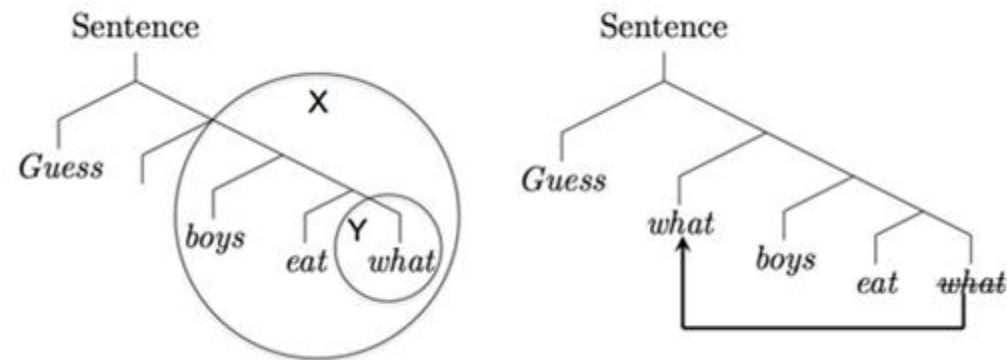
[Bolhuis *et al*. 2014]
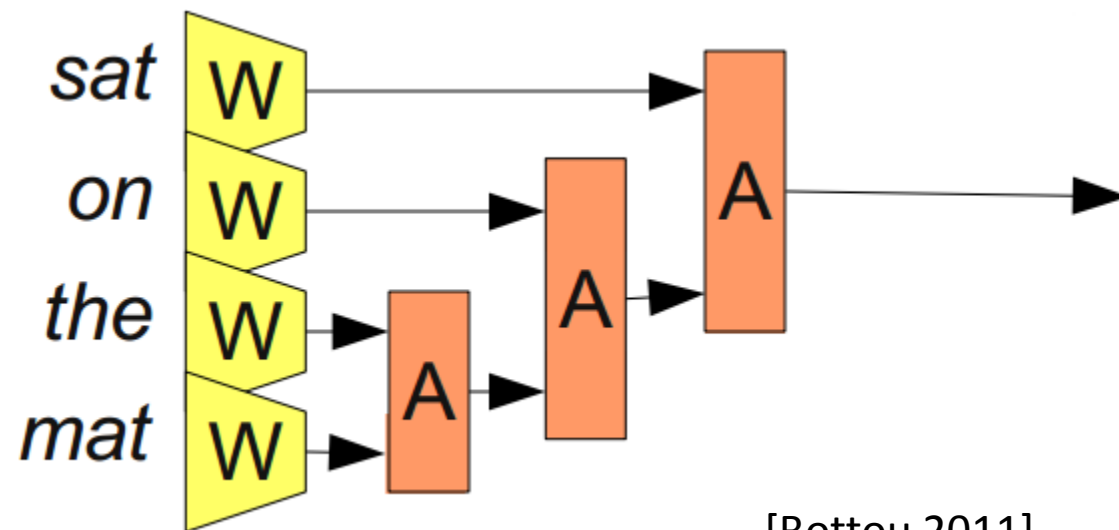
[Bottou 2011]

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